12-12-2019

The Effects of Dance on Gross Motor Skills and Strength in Students with Down Syndrome

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THE EFFECTS OF DANCE ON GROSS MOTOR SKILLS AND STRENGTH IN STUDENTS WITH DOWN SYNDROME

A Thesis submitted in Partial Fulfillment
Of the Requirements for the
Degree of Master of Arts

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School of Theatre Arts and Dance
Dance Education

December 2019

This Thesis by: Jennifer Morgan Canfield

Entitled: *The Effects of Dance on Gross Motor Skills and Strength in Students with Down Syndrome*

has been approved as meeting the requirements for the Degree of Master Of Arts in the College of Performing and Visual Arts, School of Theatre Arts and Dance, Program of Dance Education

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ABSTRACT

Canfield, Jennifer Morgan *The Effects of Dance on Gross Motor Skills and Strength in Students with Down Syndrome.* Unpublished Master of Arts Thesis, University of Northern Colorado, 2019.

The purpose of this study was to determine if weekly participation in a ballet class improved upon the gross motor skills of students with Down Syndrome. This study is important because the student participants all showed growth in their gross motor abilities as well as overall strength and physical functioning. When students with special needs are regularly exposed to dance, certain physical skills that are normally more challenging for them, improve, including gross motor functioning, increased strength, better coordination, and an increased ability to balance.

This research can be used to justify the expansion of inclusive and adaptive dance opportunities in public schools and private studio settings for the special needs student populations. Dance should be accessible to everybody, and everyone exposed to dance gains important skills that can be transferred to various areas of their lives. All children should have equal opportunity and access to dance education in both the public school and private studio settings.

The student participants in this study consisted of a group of children ages seven to fourteen all with a Down Syndrome diagnosis. The students received weekly creative dance and ballet instruction for one hour from January to April 2019. During this time, data was collected bi-weekly in the form of observational rating scales by the researcher where growth in student physical skills were observed. The student participants' parents

also shared that they witnessed improvements, at home and at school, in their children's abilities to maintain attention and focus to tasks, better behavior, and increased confidence, as well as newly built friendships outside of the home and school.

ACKNOWLEDGMENTS

This thesis project would not have been developed to its present form without the assistance of the following:

For their professional assistance and guidance, at the University of Northern Colorado: Dr. Sandra Minton and Christy O'Connell-Black (Research Advisor).

To Artists in Motion Dance Studio LLC, for offering studio space to house this adaptive dance class & study.

To the Pennsylvania Ballet Community Engagement department and Brie Stoltzfus for allowing me to be a part of this class.

To Valerie Amiss Cieslak, (Adaptive Dance Class Instructor) for allowing me to observe classes and for participating in student observational data collection.

To Samantha Freas, (Occupational Therapist) for volunteering her time to work with the students and for participating in student observational data collection.

To the student participants, thank you for enriching my life and making this study possible.

To the parents/guardians of the participants, thank you for entrusting me with your children and helping me achieve this milestone.

To Mindy Rosen, for introducing me to this opportunity and making this study possible.

To the entire UNC Dance Education Cohort 4, thank you for the constant inspiration throughout this program. You were the best support system. I learned so much from each and every one of you.

To my husband Collin, thank you for believing in me and supporting me every step of the way. Accomplishing this goal wouldn't have been possible without your unwavering love and support.

To my parents Joanne & Bill, for raising me to believe in myself and giving me the gift of not being afraid to go after my goals. Thank you for teaching me the value of hard work, dedication, and commitment.

To my brother Daniel, thank you for the encouragement throughout this program. You are the best role model, brother, and friend.

To my grandmother, Sally Callaghan, thank you for being my guardian angel in heaven throughout this program. You would have been the most proud to see me accomplish this goal because of your love, commitment, and passion for the arts throughout your life.

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CHAPTER I

INTRODUCTION

Goal of Thesis

The goal of this thesis was to report the findings of a study where children with Down Syndrome were observed participating in a dance class where they were exposed to creative movement and ballet. The students enrolled in this course included fourteen children with Down Syndrome, ranging in age from seven to fourteen, and the ballet class met weekly on Saturday afternoons. The researcher observed the students in class a total of nine times, bi-weekly, for five months to discover the impact dance has on gross motor skills and strength development in students with Down Syndrome.

Significance of Study

This study and those similar are critical for the improvement of special needs dance programming. This research may help raise awareness of the importance of special needs dance offerings across different settings like school districts, private dance studios, and community recreation departments and can influence curriculum development leading to the creation of more meaningful arts education experiences for students with special needs. This information will expose the necessity for training dance education teaching staff on the importance of inclusion and can provide information on how to best serve students with special needs.

This research study focused on observing growth in students, specifically impacted by Down Syndrome, who participated in a dance class that was solely for

students with special needs, which happened to take place at a dance studio offering classes mainly to students without special needs. The class used for research observations was the first special education dance class to be offered at this particular studio. The results of the positive outcomes from this study can serve as a roadmap to help other studios and environments offer similar courses for students with Down Syndrome, and other special needs, and offer considerations for inclusive dance classes.

While dance for students with Down Syndrome offers improvements in a whole host of important skills, this study specifically observed and monitored student gross motor skill and strength. There is a great need for more studies like this to be conducted with special needs populations in dance to note improvement and benefits in other areas as well. Offering more dance opportunities to special needs populations can improve and enrich the students' lives providing benefits to not just those students with special needs, but also to the students who work with and around them.

Nicole Reinders writes in the article, "Dreams Do Come True: The Creation and Growth of a Recreational Dance Program for Children and Young Adults with Additional Needs," that "although dance can be made accessible to anyone and everyone, there are few inclusive dance programs" (100). She also notes what positive things dance can offer all children.

> Dance is a creative activity that affects many aspects of childhood development, including physical, social, and emotional well-being (Dow 2010). Physically, dance can improve muscular strength, cardiovascular endurance, and joint flexibility (Ward 2008). Socially, dance teaches children how to follow instruction, cooperate with others, and develop friendships (Oliver and Hearn 2008). Emotional well-being is affected by the opportunity for nonverbal self-expression (Dow 2010) and increased self-confidence as the result of learning and mastering new skills (Oliver and Hearn 2008). Dance also fosters cognitive development when children are allowed to move according to their own creativity (Giguere 2011). Researchers contend that dance, unlike some other forms of

> physical activity, is suitable for children and young adults with additional needs because it can be modified to accommodate for all ability levels (Grumich 2008; Ward 2008; Dow 2010; Anjula and Redding 2013). (Reinders 100)

Reinders discusses how one barrier, standing in the way of the creation of more inclusive dance offerings across various settings, is the lack of training available for dance instructors. Dance teachers are often inadequately taught methods to teach children with disabilities such as Down Syndrome, autism, cognitive delays, attention impairments, or hyperactivity, and they may be deficient in the special education field altogether. This lack of training could be one reason why students with disabilities are not often included in recreational dance programs (Reinders 101). For more programs to be created, research studies such as this one must be conducted so that applicable findings and outcomes can be reported and shared. This could result in better education, information, and training for our dance educators, so they receive better information regarding how to best serve students with special needs. This could ultimately result in the creation of more adaptive and inclusive dance programs across different settings, proving that "anyone can enjoy dancing regardless of their age or background, if they are disabled or non-disabled, whether or not they have danced before, and whatever their shape and size" (2).

Purpose of Study

The arts have the unique ability to teach important skills and concepts that can be applied to many areas of a child's life. Dance, when taught to individuals at a young age, can improve their cognitive functioning, motor skills, and overall social and emotional well-being. Dr. Rima Faber, creator of the *Primary Movers* Program, and National Core Arts Standards President, in her article "Dance and Early Childhood

Cognition: The Isadora Effect," supports the connection between motor development and brain development. She studied the "Isadora Effect," which is the proposition that "motor development plays a primal role in brain development, and the first understanding of symbolic meaning among young children occurs from an understanding of movement and gesture." Faber also wrote that, "anecdotal evidence for the past few decades has demonstrated that dance education and the early use of symbolic movement greatly enhance cognitive development in young children" (2). It has been studied and supported that there are a great number of physical benefits of dance when introduced to young student learners.

> The physical benefits of dance in early childhood reveal themselves to dance educators and researchers. Skills gained through active participation in creative dance are numerous: Bodily strength, flexibility, and endurance (develops muscles, stronger bones, and aerobic capacity), Eye–motor coordination (enhances accuracy in observation and perception of movement for recognition and repetition), A realistic and accurate understanding of what the body is doing (makes movement conscious and develops internal awareness), Body coordination (integrates movements of parts of the body into a unified whole), Synaptic smoothness (promotes neurological connections throughout the body), Hemispheric transmission (helps coordinate brain function through the corpus collosum, the network of fibers that facilitates communication between the right and left hemispheres of the brain), Awareness and understanding of spatial relationships (involves bodily movement in space and time), An understanding of body identity, organization, shape, and design. (5)

The physical effects of dance on students with special needs, specifically Down Syndrome, have been studied very little. Nicole Reinders, a professor and researcher at the Department of Kinesiology and Physical Education at Wilfrid Laurier University conducted a case study on Dance for Down Syndrome and found that, "there is research to suggest that community-based dance is beneficial for typically developing individuals; however, there is little pertaining to individuals with Down syndrome" (2). Too often,

research is conducted on students without special needs and little can be found on the positive outcomes dance has on students with special needs. There is a need for change because the current educational reform is pressing for the inclusion of students with special needs into traditional classrooms, instead of the long-held practice of separating this type of student from the general population. There is a great need to ensure that the educational field at large is providing the same rich and diverse opportunities to the students with special needs population that the general education population receives. Inclusion is one way that educators can ensure that the special needs population is being provided with the same rich opportunities. Inclusive education in any setting (school setting, private dance studio setting, or community setting) values diversity and the unique contributions each student brings to the classroom. In inclusive learning settings, every child is provided the opportunity to feel safe, build relationships, have a sense of belonging, and learn from others' strengths and unique differences. All students, regardless of exceptionality or disability, thrive on relationship building, friendship, and a sense of belonging.

Down Syndrome is the most common chromosomal disorder. According to the Centers for Disease Control and Prevention, approximately one in every seven hundred babies in the United States is born with Down syndrome, making Down syndrome the most common genetic chromosomal condition. "About 6,000 babies with Down syndrome are born in the United States each year" ("What is Down Syndrome?"). With nearly 6,000 children born in the U.S. each year impacted by the condition, there is a need for more research to be done to not only document the positive outcomes of dance

when offered to students in the special needs population, but to also help grow and provide rich curricular and extra-curricular opportunities for these children.

As Reinders states in her journal article, "Dancing with Down syndrome: A Phenomenological Case Study,"

> Dance for individuals with Down syndrome has many benefits; however, there is little research on this topic. Down syndrome is the most common genetic condition, resulting in psychological, physical, and social impairments. There is research to suggest that dance may be a beneficial activity for people with Down syndrome; however, there is little research to substantiate the effects of participating in a community dance class. (1)

It is known that individuals with Down Syndrome suffer from developmental delays and lifelong health problems. Dance can be used as a suitable form of recreation and therapy to help build important physical skills and functioning. The goal of this research study is to see if there is a correlation between improved motor functioning in students with Down Syndrome and participation in a community recreational ballet class.

Children with Down Syndrome are often impacted by a condition called Hypotonia, which results in poor muscle tone and low strength. This condition can lead to gross motor delays. Despite these delays, children with Down Syndrome can and should participate in physical activities. Reinders also notes,

> Many people with Down syndrome display hypotonia (low muscle tone) and are slow to develop movement skills as a result of impaired neurological development. Specifically, the cerebellum of people with Down syndrome is smaller and less dense than that of their typically developing peers (Pinter et al. 2001), which results in balance, motor control, and motor learning deficits. In addition, the corpus callosum is thinner causing disrupted efficiency of bimanual movement. (4)

The purpose of this research project is to investigate the potential physical gross motor skills and change in strength that dance could provide to young children with Down Syndrome. Positive findings from this one study could be added to the growing body of

research in support of the benefits of dance for students with special needs, the benefits of inclusive dance programs, and the growth and benefit of adaptive dance programs.

This project sought to answer the following questions:

Q1 Does participation in a weekly dance class have an effect on the gross motor skill development of students with Down Syndrome?

Q2 Does participating in a weekly dance class, receiving ballet instruction, and working with the ballet class instructor and occupational therapist in class increase overall muscle strength in the participants?

This research attempted to provide data indicating that when students with Down Syndrome participate in a weekly dance class, their participation leads to strengthened gross motor abilities necessary for increased independence and an improved quality of life. The results of the study will be added to the already growing archive of research in favor of dance for students with special needs, as well as help to provide information necessary to aid in seeking funding for adaptive and inclusive dance programming.

CHAPTER II

LITERATURE REVIEW

What is Down Syndrome? A Brief History And Overview of the Condition

Each cell in the human body contains a nucleus. In each nucleus, genetic material is stored in the gene. Genes are what carry the code that is responsible for all inherited traits. Genes are grouped along rod-like structures called chromosomes. In most people, the nucleus of each cell contains 21 pairs of chromosomes; half are inherited from each parent. Down Syndrome occurs when an individual has a full or partial extra copy of chromosome twenty-one. Because of this additional genetic material, it alters the course of development and causes the characteristics associated with Down Syndrome. Some common physical traits of Down Syndrome include low muscle tone, small stature, an upward slant to the eyes, and a single deep crease across the center of the palm. Each person impacted by Down Syndrome is a unique individual and may possess these characteristics to different degrees, or not at all ("What is Down Syndrome").

Down Syndrome, according to the Centers for Disease Control and Prevention affects one in every seven hundred babies born in the United States, making it the most common chromosomal condition. Six thousand babies with Down Syndrome are born in the United States each year. In the late nineteenth century, physician John Langdon Down published an accurate description of a person with Down Syndrome (National

Down Syndrome Society). Because of this, he earned the title of "father" of the syndrome. In more recent history with the help of advances in medicine and science, researchers have been able to investigate the characteristics of people with Down Syndrome. Most recently, in the year 2000, an international team of scientists successfully identified and catalogued each of the approximately 329 genes on chromosome twenty-one. This opened the door to great advances in Down Syndrome research.

There are three different types of the condition, Trisomy 21 (Nondisjunction), Mosaicism, and Translocation. Trisomy 21 "nondisjunction" occurs when an embryo has three copies of chromosome twenty-one instead of the usual two. As the embryo develops the extra chromosome is replicated in every cell of the body. This type of Down Syndrome accounts for ninety-five percent of cases. Mosaicism, more commonly known as mosaic Down Syndrome, is diagnosed when there is a mixture of two pairs of cells. Some contain the usual forty-six chromosomes and some contain forty-seven, resulting in an extra chromosome twenty-one. This form of Down Syndrome is rare and accounts for about one percent of all cases. The final type of Down Syndrome is Translocation. It occurs when the total number of chromosomes in the cells remains forty-six but an additional full or partial copy of chromosome twenty-one attaches to another chromosome, usually chromosome fourteen. This type accounts for about four percent of the cases of Down Syndrome. Regardless of the type of Down Syndrome a person has, all people with the condition have an extra critical portion of chromosome twenty-one present in all or some of their cells. The presence of this additional genetic material alters

the course of development and causes the characteristics, which are associated with Down Syndrome (“What is Down Syndrome”).

The cause of the condition is still unknown. A maternal age of thirty five or older, known as a geriatric pregnancy is the only factor that has been scientifically linked to an increased risk of having a baby with the condition resulting in the nondisjunction or mosaicism type of Down Syndrome. Since there are higher birth rates in younger woman, 80% of children with Down Syndrome are born to women under age thirty five. There is no scientific research that indicates that Down Syndrome is caused by environmental factors or that the habits of the parents before or during pregnancy lead to an increased prevalence. The additional copy of chromosome twenty-one which causes the condition can originate from either parent. Studies show that approximately 5% of the cases have been traced to the father. Down Syndrome does not typically run in families; however, once a woman has had one baby with Down Syndrome, her risk of having a second is one in one hundred up to the age of forty. The condition can be diagnosed through prenatal testing or at birth (“What is Down Syndrome”).

Delay in Motor Skill Development
In Children with
Down Syndrome

Most children with Down Syndrome typically have the natural desire to do all the same things that other children do, such as, sit, crawl, walk, explore new environments, and interact with other people around them. To perform such tasks all children must develop gross motor skills. Because of certain physical characteristics a child with Down Syndrome has, developing these gross motor skills is more challenging. Some of the characteristics that lead to gross motor skill development delay include hypotonia (low

muscle tone), ligamentous laxity (looseness of the ligaments that causes increased flexibility in the joints), and decreased strength. Children with Down Syndrome do not develop motor skills in the same way that a typically developing child does. Children with this condition will find ways to compensate for the differences in their physical make up and some of the compensations can lead to long term complications. Examples of such complications include pain in the feet or the development of an inefficient walking pattern. Patricia Winders, Senior Physical Therapist and Down Syndrome Specialist at the SIE Center for Down Syndrome in Aurora Colorado talks about how children with Down Syndrome need to be explicitly taught to learn proper gross motor functioning which reduces the risk of long-term complications through physical therapy sessions (Winders).

The goal of physical therapy for children with Down Syndrome is not to accelerate the rate of their development, but rather to facilitate the development of optimal movement patterns. Gross motor skills that are worked on in therapy sessions include good posture, proper foot alignment, an efficient walking pattern, and a good physical foundation for exercise throughout life (Winders).

Positive Attributes of Physical Activity for Students with Disabilities

In the United States, twenty percent of the population has a disability and individuals with a disability are fifty seven percent more likely to be obese than individuals without disabilities. Individuals with disabilities are three times more likely to have a chronic disease such as heart disease, diabetes, stroke or cancer, than individuals without a disability. The impact of these chronic diseases can be reduced

by aerobic physical activity (“Physical Activity in Individuals with Disabilities”). If exercise can provide significant benefits for children in all developmental stages of life, it only makes sense that regular participation in physical education classes would also promote positive advancements in students with special needs. Findings from Physiopedia, a comprehensive online reference written by physiotherapists for physiotherapists, suggests that physical education programs can do a great deal to improve the lifestyle and overall health in children with special needs. They can increase competency in gross motor skills, aid in controlling obesity, improve self-esteem and social skills, encourage an active lifestyle, and maintain motivation in various areas of students’ lives (“Physical Activity in Individuals with Disabilities”).

Participation in physical activity often leads to improved levels of well-being and physical health. Children who have diagnosed intellectual disabilities could have additional physical disabilities, which can result in below age-level performance in typical motor skills. Regular involvement in physical education, sports, and exercise can help them to develop the skills they need. When these students are encouraged to participate in frequent fitness measures, many of these students see improvements in skills such as hand-eye coordination, flexibility, muscle strength, endurance, and even cardiovascular efficiency. Development of improved motor skills and enhanced physical health helps individuals fight back against obesity and the health complications that follow (“Physical Activity in Individuals with Disabilities”).

Regular exposure to exercise through physical education classes has numerous benefits for a child’s mind. Regular fitness practice is linked to improvements in self-esteem, social awareness, and self-confidence. All these skills

are essential for empowering the lives of young individuals with special needs. Physical activity improves general mood. It also improves wellness in children suffering from anxiety and depressive disorders. Providing a physical outlet can help students cope with anxiety, stress, and depression. Physical outlets provide children with interaction and a sense of accomplishment. For students with special needs, developing a sense of self-worth can be critical since these children can often feel isolated from their peers. When people in general have a positive self-image, they can also thrive in other areas of their lives. Students with special needs' skills in other areas can improve if they have a positive self-image and increased confidence. ("Physical Activity in Individuals with Disabilities").

Physical activity leads to cognitive improvements in children with special needs, allowing them to access skills that may not be accessed in a traditional classroom setting alone. The structure of physical activity classes that aligns with a set of rules and organization can help children develop and regularly practice self-regulation. It also helps improve decision-making skills. Children with special needs can learn to focus on specific goals and improve both verbal and non-verbal communication skills through participation in a physical activity.

Physical education teaches a child a much more than simply learning how to engage in a particular sport. It teaches children a range of skills including how to be a part of a team, how to problem solve, increased attention span, and a more focused task-based behavior. These skills eventually transfer into other areas of the children's lives such as in the classroom and may increase the child's ability to learn and

engage with their peers outside of physical education ("SPARK Physical Education Curriculum").

How Dancing with Disabilities Enriches the Field of Dance

Dance for children with disabilities enriches the field of dance because it simply allows more people with varied and diverse backgrounds and abilities to access the art form and physical activity. Michele R. Zitomer, employee of the Department of Kinesiology and Physical Education at McGill University writes, "Participation in an integrated dance program can have a positive impact on children's perceptions of dance ability and a more subtle impact on able-bodied children's perceptions of disability" (Zitomer and Reid). Not only does dance have a lasting powerful impact on the special needs population, it has a lasting powerful impact on able-bodied children and adult perceptions. Most dance programs give "students a space where they could just be themselves, enable self-expression, and allow opportunities for getting to know more about themselves and their personal capacities" (Zitomer and Reid 220).

Dance involving individuals with disabilities is typically interpreted as dance therapy. Inclusive dance is not the same as dance therapy, in fact the two are quite different. In dance therapy, dance is used as the psychotherapeutic tool for healing the mind, body, and spirit. Adaptive/inclusive dance conversely relates to modifying dance activities, attitudes, and behaviors, surrounding dance and disabilities to promote equal participation opportunities for individuals with disabilities. The implementation of more inclusive/adaptive dance programs may help to enrich the field of dance by spreading opportunity, awareness, growth, and change among the disabled and able-bodied populations, because as a society we tend to compare and categorize people based on set

standards regarding what is already perceived and understood, a term defined as "ableism." Individuals who deviate from these societal set perceptions/norms are perceived as disabled. (Zitomer and Reid 2)

Providing more special needs and inclusive dance offerings across a variety of settings can help to change some of the stigmas and "ableistic" perceptions around dance as well as aim to provide more opportunities among this population. One example of such change is the Karen Peterson Dancers, a company that is enriching the field of dance by working to redefine it by being a physically integrated dance company. KPD is Florida's only full-time dance organization that features choreography and performances by dancers with and without disabilities. They have served as a role model for the artists and special needs communities in Miami Dade County for twenty-nine years. The company's artistic director and founder, Karen Peterson, provides educational programming for students with special needs and provides inclusive rehearsal, performance, and touring opportunities for professional dancers and choreographers with different diverse abilities. KPD is currently the only organization that has committed a history of providing dance workshops, lectures, and performances for thousands of audience members, teachers, therapists, and special needs students interested in this integrated form of dance.

Peterson has been recognized for her vision, creative and collaborative spirit, and has won over both the special needs and typical dance populations, which has made the art of dance possible. She has also provided special needs and integrated dance opportunities for many across different settings.

> Since the incorporation, the company has serviced over 5000 teens with disabilities within the Miami Dade schools, has greeted and performed with over 100 International dance artists abroad and in Miami and has engaged over 10000

> dance audience members in formal and informal concerts to the visions of possibilities of inclusion with ideas of dance and disability. (“History”)

Serving as a pioneer for such opportunities in the dance community, many companies are now beginning to follow suit and develop an interest in the arts for the special needs community. In time, with more research and awareness, more disabled individuals will be able to have the same rich dance experiences as able-bodied individuals. Adding the special needs population’s unique skillset and interpretations of dance to the dance community is bound to enrich the field as a whole. According to Zitomer and Reid,

> “Kaufmann (2006) defines dance ability based on five constructs:
>
> (1) body awareness;
>
> (2) spatial awareness;
>
> (3) ability to follow oral instruction and music cues;
>
> (4) ability to imitate movement; and
>
> (5) visualisation and recall skills.

This definition does not offer reason to assume an individual with disabilities would be unable to dance”(Kauffman as qtd. in Zitomer and Reid 3).

How Dance Affects All Bodies

When speaking about the general population, dance offers many positive effects. Markham Heid conducted a study and wrote an article in Time Magazine entitled, “Why Dancing Is the Best Thing You Can Do For Your Body,” discusses how dance is known to provide positive outcomes on both the body and mind. According to his study, he found that a person can expect to burn more than three hundred calories from dancing every half hour, exceeding the amount of energy a person burns during a run or by

swimming. He goes further stating that even tamer forms of dance burns about the same number of calories as cycling. Dance demands a large amount of energy from the human body; when compared to swimming, running, and other propulsive forms of physical activity research found that dance requires movements in all directions, whereas the other forms of physical activity use only rhythm and momentum to keep moving. In the same article, a research study through the University of Brighton is discussed, it was found that there is much accelerating and decelerating in dance, which makes the body less able to do in an energy efficient way. Dancing also is shown to help better engage lower body joints and muscles when compared to other physical activities. Dance also helps to train many of the body's smaller support muscles and tendons due to the up-and-down and side-to-side movements of dance (Heid).

It was also found that dance, like other forms of cardiovascular exercise, has a positive impact on mood and mind. Dance, when compared to other forms of cardiovascular exercise, demonstrated improved energy, lower stress, and enhanced mood. Heid's article also discusses a study conducted by *Frontiers in Aging Neuroscience* that found dancing could improve the "white matter" integrity in the brains of older adults. The white matter in the brain can be thought of as connective tissue that tends to break down gradually as a person ages. This can lead to a loss of processing speed and thinking and memory problems that can arise later in a person's life (Heid).

Another study discussed by Scott Edwards, a freelance science writer based out of Massachusetts writes in an article published by Harvard University, "Dance, essentially—constitutes a "pleasure double play." Music stimulates the brain's reward centers, while dance activates its sensory and motor circuits" (Edwards). Edwards also

discussed a study in the New England Journal of Medicine conducted by researchers at the Albert Einstein College of Medicine. This study discovered that dance could decidedly improve brain health. This study investigated the effects of leisure activities on the risk of dementia in the elderly. The researchers looked at eleven different types of physical activity some of which included cycling, golf, swimming, and tennis. Only one activity out of the eleven, dance showed a lowered risk of dementia. This is because dancing involves both mental effort and social interaction. The type of stimulation that only dance can offer helps to reduce the risk of dementia. Dance has also been found to be helpful for patients suffering from Parkinson's disease. The disease develops when the dopamine-producing cells in the brain are lost. The chemical dopamine is an essential component of the brain's system for controlling coordination and movement. Dance can be presented to these patients in a series of fixed rhythms that they are asked to move to. Studies have found dance to be helpful to people with Parkinson's disease as well as other movement disorders. Dance was found to improve gait and upper extremity functioning. (Edwards)

How Dance Positively Affects School Performance in the Inclusive Classroom

Dance when incorporated in the school environment, offers a host of positive benefits as well. Teachers may choose to include dance in their educational curriculum for several different reasons. General classroom teachers might weave dance into daily activities to help accommodate the needs of students who learn in nontraditional ways. Dance in the classroom allows students to learn content through engaging their senses providing a multisensory approach to learning as well as engaging a mind body learning connection. Dance can also be used in the classroom to improve student academic and

social outcomes (Munsell and Bryant Davis 2). Regular exposure to dance for special education students also has many mind and body benefits. Munsell and Bryant Davis write,

> All students, regardless of ability level, need to engage in regular physical activity. Not only does involvement in physical activities help fight childhood obesity, it also improves coordination. Some students with disabilities, such as children with Down syndrome, struggle to master motor skills, frequently displaying poor control of their body movements due to decreased strength and slow reaction times. Although students with Down syndrome may eventually reach motor milestones, it generally takes them much longer than it does their nondisabled peers and often proves to be a frustrating process. To help children with Down syndrome reach these milestones in a fun way, Jobling,Virji-Babul, and Nichols (2006) devised a movement program specifically addressing the physical needs of these students. The training program, on the basis of Laban's movement framework (1963), is constructed around exploring the core concepts of space, weight, time, and flow. The researchers discovered that "for children with intellectual disabilities such as Down syndrome, Laban's core concepts...could be used with a movement education approach to provide an ideal framework within which children can learn to move" (pp. 35–36). Jobling, Virji-Babul, and Nichols (2006) created the program with four main goals in mind: (a) developing body, space, and effort awareness, (b) developing a movement language, (c) developing confidence in movement by allowing students 130 Munsell and Bryant Davis sufficient time for movement exploration, and (d) developing opportunities for students to interact and communicate with each other. According to the teachers, students who participated in the program displayed improved communication skills, improved body awareness, and improved respect for personal boundaries. Although this program was designed specifically for students with Down syndrome, the structure of the program appears to be adaptable and usable in a varying exceptionalities classroom.(3)

Incorporating dance into the inclusive classroom curriculum may help accommodate the needs of non-traditional learners as well as traditional learners. Students with special needs commonly have difficulties mastering linguistic and mathematical tasks. For these students especially, weaving creative and kinesthetic tasks such as dance into classroom curriculum may result in an increased ability to learn academic material. When learning is presented to students in engaging, multisensory, and kinesthetic ways, all students, with and without different learning needs benefit. Positive

outcomes were found when creative movement activities were used in an inclusion classroom setting to teach literature to a group of fourth and fifth grade students. Some of the students in the group had special needs. The study discussed in Munsell and Bryant Davis' journal, found that using dance in the classroom appeared to meet the learning needs of a variety of students with disabilities, including students on the autism spectrum, students with emotional disabilities, students with learning disabilities, and lastly, students with cognitive disabilities. The students in the study with disabilities showed increased understanding of character, plot, and overall story comprehension of novels read when creative movement was used in the classroom. Along with improved academic outcomes, when dance was used in the classroom during this study, results also showed increased physical fitness as well as improved social emotional awareness.

Adaptive Dance: What is it? Considerations for Program Creation

Adaptive dance is an opportunity to explore and experience the joy of movement in a supportive and creative community regardless of one's experience or abilities. Such programs can also be used as an opportunity to integrate various levels of experience and abilities in a powerful, educational, and exciting way. When establishing a definition for an adaptive dance program, it is important to keep in mind the goals for the program, the students, and the community. Important questions to ask when implementing a program might be: whom are you trying to reach? What barriers are you intending to break down? What would you like the program to accomplish? The most important key component to any adaptive dance program is respecting the idea that anyone can dance. It is also important to establish some boundaries for the program and classes. Establishing

boundaries will make new programs more productive and beneficial for the participants. Boundaries do not negate the idea that everyone can dance, instead it makes the program more successful for all involved. When boundaries are created for such programs a productive learning and social environment is created. Some adaptive dance programs offer a variety of classes, which allows the focus to be on simply placing each student in a class that best suits them. Other programs are limited to a specific focus, which limits participants based on the definition of the class or program. Should one consider beginning an adaptive dance program, a helpful tool in the beginning is developing an "intake form." This is useful for determining potential student placement and the development of appropriate classes based on need. Other important factors that should be kept in mind for the development of adaptive dance programing are student learning styles, student support needs, and student medical histories. Adaptive dance programs can be offered in different settings, including, but not limited to, public schools, private studios, and community offerings (Greenburg 4).

The Inclusion Learning Model:
What is it?

Inclusive education can take place in more settings than just an academic classroom and is gaining more recognition. Inclusive education happens when children with and without disabilities attend classes alongside each other. For some time, children with disabilities were educated separately or in separate schools all together. People got used to the idea that special education meant separate education. Now we know that when children with disabilities are involved with children without disabilities in a learning environment, positive academic and social outcomes occur for both populations. Inclusive education needs ongoing advocacy, planning, support, and commitment.

Some principle guidelines have been created for quality inclusive education by the Inclusive Education PBS Parents group including the ideas that all children belong, all children learn in different ways, and every child has the right to be included. Inclusive education is a right, not a privilege. The Individuals with Disabilities Education Act clearly states that all children with disabilities should be educated with non-disabled children their own age and have access to the general education curriculum through the least restrictive environment ("Inclusive Education"). These fundamental principles should not be limited to just academic classrooms in public school settings where most inclusive education currently exists. This is a starting point, not an end result for inclusive programing. It is important that more advocacy work and research is done to spread awareness for such programing for dance education and other arts education in public school, private school, and private dance studio settings.

CHAPTER III

METHODOLOGY

General Research Perspective

This chapter will discuss the process used to answer the following questions: Does participating in a weekly dance class have an effect on the gross motor skill development of students with Down Syndrome, and does participating in a weekly dance class, receiving ballet instruction, and working with the ballet class instructor and occupational therapist in class increase overall muscle strength in the participants? The research methodologies used for this study were both quantitative and qualitative and the tools used included parent pre and post-surveys, observation rating scales completed by the volunteer occupational therapist, observation rating scales completed by the adaptive dance class instructor, and observation rating scales completed by the researcher. The research consisted of fourteen participants, one researcher, one adaptive dance class ballet instructor, and one occupational therapist.

After developing the purpose of the study and the means for data collection, the researcher submitted a narrative detailing the study to the Institutional Review Board (IRB) for approval. This application, submitted to the board, included a brief description of the goals of the study, the purpose of the study, methods used, data analysis procedures, data handling procedures, risks, discomforts, and benefits. Sample

consent forms for the students, parents, class instructor, and occupational therapist who participated in the study were included. The appendices include all IRB documents.

Participants & Classroom Setting

The participants for this study attended Artists In Motion Dance Studio each Saturday over the course of the 2018-2019 dance year. The students who participated were found and recruited for participation in the class through the Pennsylvania Ballet Community Outreach Program. The class began its weekly sessions in September, 2018, and ended in May, 2019. The researcher began observations in January, 2019, and concluded observations in April, 2019. The researcher would attend class about every other week over the course of four months to collect observational data to fill out the observational rating scales for each of the student participants. The students ranged in age from seven to fifteen years old. The class consisted of twelve girls and two boys. All fourteen students enrolled in the course participated in the study. The researcher aided in getting this adaptive dance program housed at Artists In Motion Dance Studio because it is one of the studios where the researcher teaches. It was important to the researcher and the program outreach coordinator that the class be housed at an actual dance studio setting so the student participants could experience what participating in a dance class in a "real" dance studio was like.

All student participants needed parental approval to participate in the study due to their ages, and each student participant signed a student assent form. One parent or guardian for each of the fourteen student participants signed a parental consent form. The researcher collected each consent and assent form the week before the first formal observation. The researcher also passed out a pre-survey to each of the student

participants' parents the week before the first formal observation. Once all consent forms, assent forms, and pre surveys were collected by the researcher the study began. Each of the student participants received a number to protect the confidentiality of the students.

Types of Data Collection Materials:
Parent Pre & Post Surveys

The researcher provided each of the students' parents with a pre survey a week before beginning of the study. The survey asked the parents to check one box for each of the listed skills based on their opinion of their child's ability to perform each of the gross motor tasks. The parents were asked to decide if their child could complete each of the listed gross motor skills consistently, some of the time, or not mastered yet. The survey included a list of fifteen different gross motor skills. Some of the listed skills included running, skipping alternating feet, hopping with two feet, balancing on one foot, and walking in a straight line facing both forwards and backwards. The parents of the student participants were also asked to complete three open-ended response questions. These questions included: "Please describe your child's gross motor skill functioning and overall strength to the best of your ability." "Has your child ever received physical therapy for motor skill functioning/physical functioning?" and "Please explain how you think your child will benefit physically (gross motor and overall strength wise) from participating in a weekly ballet class?"

During the final week of the study, the parents were asked to complete a post observation form. This time, the parents were asked to fill out the same series of questions pertaining to their opinion of their child's ability to complete the same gross motor tasks. The parents were also asked two different open response questions regarding their child's experience and skills. The open response questions asked on the post survey

included: “Do you feel that your child’s gross motor skills and overall strength have improved from participation in a weekly ballet class? Please include your thoughts about your child’s overall coordination, strength, balance, etc. Please be specific.” And “Has participation in dance positively impacted your child in any other areas of their lives? (Examples include: school performance, attention, overall confidence, motivation, behavior, other therapies/activities they participate in?) Please be specific.

Researcher Observation
Rating Scales

Beginning week one of the study, the researcher completed observation rating scales (one for each of the student participants) during each of the hour-long class observations. The researcher observed sixteen different gross motor and strength skills during each of the nine class sessions. The students were rated using a scale rating of one to five. A score of one meant that the student performed the skill very poorly. A score of a five meant the student performed the skill very strongly. The researcher would record “not observed” if a skill had not been observed yet by a particular student. If a student were absent a particular week, the researcher would record “absent.” The same sixteen skills were observed at each observational time, each of the nine weeks, for all fourteen student participants.

Class Instructor and Occupational
Therapist Observation
Rating Scales

The adaptive ballet class instructor and the occupational therapist were given the same observational rating scales that the researcher used. They were both asked to complete observation rubrics after week one and week nine (the first and last week of the study). They were asked to complete the same observation rating scales as the researcher

in an effort to show student growth from the beginning to the end of the study. They were also asked to complete the same observational rating scales as the researcher to help prevent researcher bias. The goal was to have all three scales (week one scores and week nine scores) completed for each student by the researcher, the class instructor, and the occupational therapist show similar scores, results, and growth over the course of the study.

Data Analysis Process

The data was analyzed both quantitatively and qualitatively. Quantitative data analyses were done in the form of bar graphs to analyze the researcher, dance class instructor, and the occupational therapist's observational rating scale responses. The scores were added, calculated, and analyzed two different ways. In the first analysis, the researcher added the week one and the week nine scores together (out of a possible five points for each skill) for all sixteen different gross motor and strength skill areas to calculate a total score out of a possible eighty points for each student participant. Then, the total scores for each student (week one and week nine) were divided by the total number of categories (sixteen) to get a beginning and ending average score for each student across all areas.

The researcher then organized a bar graph adding and calculating the fourteen student participants' total scores together from week one and week nine. This was done for the researcher's observational scores, as well as the class instructor's, and occupational therapist's scores. Then, the same was done for the student average scores for week one and week nine. All student average scores were added together.

The researcher's qualitative data that was collected during the study included observational notes taken during class recording what the students were being asked to do and how they responded to it. The parents of the student participants also contributed to qualitative data collection through pre & post survey open-ended question responses as well as verbal communication about their thoughts on the program and their child's perceived progress.

Justification of Methodological Choices

The researcher decided to collect data for the study, both quantitatively and qualitatively, from the parents of the student participants, the class instructor, and the occupational therapist in hopes of gaining a broad perspective. The researcher's quantitative data was collected in the way in which the data could show a common trend in the numbers from all three adult professionals working with and observing the student participants through both average scores and total scores. The researcher's qualitative data was collected through pre & post survey open ended responses completed by the parents to see if there was a common thread both at the beginning and end of the study. The researcher gained qualitative information important to the study through formal observational note taking during class as well as informal discussions with the parents during class time.

Summary

This chapter explained the instruments used to gather information on the nine classes that the researcher observed. The next chapter will discuss the findings and results of this research.

CHAPTER IV

DISCUSSION

As discussed in previous chapters, this research intended to answer the following questions:

Q1 Does participation in a weekly dance class have an effect on the gross motor skill development of students with Down Syndrome?

Q2 Does participating in a weekly dance class, receiving ballet instruction, and working with the ballet class instructor and occupational therapist in class increase overall muscle strength in the participants?

This chapter draws relationships between the research questions and the parent feedback through completed pre & post surveys. This chapter also extracts results from the research questions and the researcher's, the ballet class teacher's, and the occupational therapist's scores that were completed for each of the student participant observational rating scales.

Parent Pre and Post Survey Data

The week before the study began, and during the last week of the study, the researcher gave each student participant's parent a copy of the "Parent Pre-Post Survey" found in Appendix section D. The parents were asked to evaluate their child's ability to perform each of the listed gross motor and strength tasks to the best of their ability. The parents were asked to choose from one of the three rating options which included, "yes, consistently," "yes, but only some of the time," and finally "no, not mastered yet." The outcomes show how many times each parent selected a "yes, consistently" rating at the

beginning of the study versus the end of the study. The results will be discussed below using a bar graph.

The following figure shows how many times the parents of each student participant checked a rating of "yes, consistently" on their child's pre-survey versus how many times they selected the same rating on the post-survey. The data shows that seven of the fourteen parents felt that their child's gross motor skills and overall strength improved or stayed the same as a result of the study.

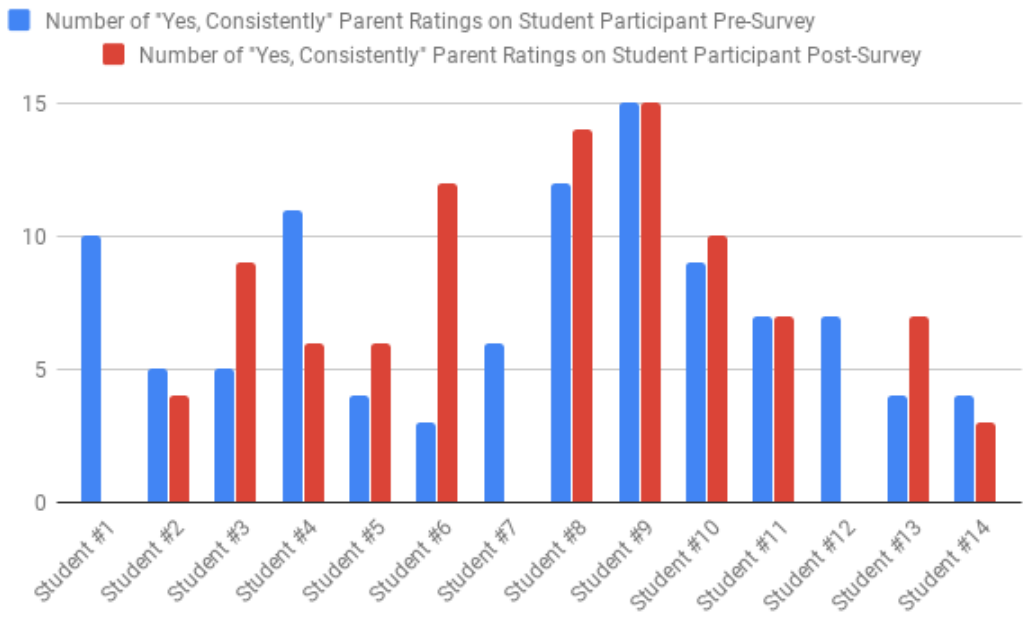

Figure 1. Parent Pre-Post Survey Responses

The parents were also asked three open-ended response questions on the pre-survey. These questions asked the parents to, "describe your child's gross motor skill functioning and overall strength to the best of your ability," answer, "has your child ever received physical therapy for motor skill functioning/physical functioning", and finally,

"please explain how you think your child will benefit physically (gross motor and overall strength wise) from participating in weekly ballet class?"

Some of the parent responses to the first question, which asked them to describe their child's current gross motor functioning and strength were as follows: Student #1's parent wrote, "She has fair gross motor skills. Most of her issues come from stamina. She gets tired easily and then gives up." Student #2's parent wrote, "She can climb, but she is reluctant with stairs (mostly coming down). She can run but not fast. She also has a history of juvenile arthritis which can affect her motor development." Student #4's parent wrote "She has pretty good skills and is highly functional. She can imitate very well and follow directions. Her right patella is unstable and she tends to be unstable with her leg straight, her leg can buckle and she falls." Student #12's parent wrote "she does fairly well and similar to her peers during activities but lacks confidence, fluidity, and speed." Student #13's parent wrote "She has overall low muscle tone and has some difficulty with balance and stability on her feet." Finally Student #14's parent wrote "She is below average for her age regarding her motor skills, but she is determined!"

Some of the parent responses on the pre-survey to the second question, which asked them to outline what types of physical therapy services their child has received for gross motor functioning included the following: Student #1's parent wrote, "yes, from four months old." Student #2's parent wrote, "Yes, since birth." Student #3's parent wrote, "She received physical therapy from Early Intervention since infancy to age three. She has received physical therapy at school and with Extended School Year in the summer since." All of the other student participant's parents wrote similar responses and said yes to their children receiving physical therapy. Only one parent responded "no,"

which was student #8's parent. She wrote, "He received physical therapy until he was 18 months old but has displayed age appropriate gross motor abilities since then."

Finally, some of the parent responses to the third and final question on the pre-survey, which asked them to explain how they think their child would benefit physically from participating in a weekly ballet class, included: Student #1's parent wrote, "I'm hoping it will improve her ability to move for a longer period of time." Student #2's parent wrote, "Core strength, balance, and overall strength." Student #4's parent wrote:

> I think the structure of a weekly class will benefit movement and help strengthen her muscles. I feel dance will help improve stamina, attention, posture, movement as well as help strengthen muscles that she wouldn't normally use outside of dance class. I feel that the movement with dance incorporating the total body will improve her strength, movement, tone, ect.

Student #5's parent wrote, "It will help her to just become more aware of her own body in space, gain better balance, and strengthen her muscles." Other parents responded with similar comments which included hoping to see improvements in their child's coordination, core strength, balance, improving strength and mobility of non-favored sides of the body, hand eye coordination, following directions, and listening skills.

The post-survey asked parents, "Do you feel that your child's gross motor skills and overall strength have improved from participation in a weekly ballet class? Please include your thoughts about your child's overall coordination, strength, balance, etc. Please be specific." and "Has participation in dance positively impacted your child in any other areas of their lives? (Examples include: school performance, attention, overall confidence, motivation, behavior, other therapies/activities they participate in?) Please be specific.

Some of the parent responses to the first question where as follows: Student #3's parent wrote, "Yes I feel my child's strength has improved. Her physical therapist commented in her IEP meeting that she spontaneously started doing some exercises that the physical therapist did not know she was even capable of." Student #4's parent wrote:

> Yes I do feel that my child's gross motor skills and overall strength have improved from participation in a weekly ballet class. I also feel that it has helped strengthen her legs and her dislocating right patella. The consistency and movement has proven to be beneficial. My child loves to dance and a structured dance/movement class has improved her coordination, strength and balance. She also has an increased interest in dancing as a result of this class.

Student #6's parent wrote, "Participation in the weekly ballet class has improved his coordination and focused task execution. He's better able to listen and comply with instructions and requests." Student #8's parent wrote, "I feel he has improved from class. He has better coordination, and listening skills. Student #9's parent wrote, "Yes, dance has motivated her to do more than normal because she loves it!" Student #10's parent wrote, "I have seen improvements with her balance and strength."

Some of the parent responses to the second question, "Has participation in dance positively impacted your child in any other areas of their lives? (Examples include: school performance, attention, overall confidence, motivation, behavior, other therapies/activities they participate in?) Please be specific," were as follows: student #2's parent said, "Her attention and behavior had improved." Student #3's parent wrote:

> Since my daughter has started ballet she has greatly improved socially and in her special area classes. While academic progress is still slow, she is greatly better at dressing herself, such as putting on socks. Behavior has improved. Her bike riding skills are improving. She knows her routine and takes off her shoes when she comes into the home. During the course of ballet, I have started teaching my daughter to play piano. While progress is extremely slow, she is at least receptive to it in very small increments.

Student #4's parent wrote:

> This class has been nothing but positive in all areas of my child's life. Her attention has been more than amazing. She has gained more focus as well. She has gained confidence in a group setting as well as independence from her teacher in performing tasks. Her interest, motivation, confidence, etc. have all improved. The results of her participation have been tremendous. Our children tend to be shy and quiet, especially when exposed to new things and new people. Over the weeks, I have seen how all the children who have participated have gained confidence in themselves and in their abilities to perform the actual dance steps. Their attention and focus improved greatly over the weeks and each class. We saw positive changes in our children. It has been a beautiful blooming process and amazing to have our children participate and grow in this program.

Student #9's parent wrote, "I used to think she had ADHD because she had trouble focusing. She is very focused now and she doesn't give me any trouble doing homework anymore. She's very motivated and focused. Student #8's parent wrote "Yes, this class has allowed him to express himself in different ways and he has lots of confidence." Student #11's parent wrote, "We have seen improvements with her physical therapy and occupational therapy sessions and skills."

The parent responses from the pre & post survey questions agree with Rima Faber's PhD research that:

> The arts have the unique ability to teach important skills and concepts that can be applied to many areas of a child's life. Dance, for example, when taught to young children can improve their cognitive functioning, motor skills, and overall social and emotional well-being. (Rima Faber PhD, creator of the *Primary Movers* Program)

The parent responses also agree with Nicole Reinder's research that:

> Dance is a creative activity that affects many aspects of childhood development, including physical, social, and emotional well-being. Physically, dance can improve muscular strength, cardiovascular endurance, and joint flexibility. Socially, dance teaches children how to follow instruction, cooperate with others, and develop friendships. Emotional well-being is affected by the opportunity for nonverbal self-expression and increased self-confidence as the result of learning and mastering new skills. Dance also fosters cognitive development when children are allowed to move according to their own creativity. Researchers

> contend that dance, unlike some other forms of physical activity, is suitable for children and young adults with additional needs because it can be modified to accommodate for all ability levels. (Reinders 100)

The parent responses to the open-ended response questions also agree with Munsel and Davis' research proving that children with Down Syndrome benefit from participation in regular physical activity.

> All students, regardless of ability level, need to engage in regular physical activity. Not only does involvement in physical activities help fight childhood obesity, it also improves coordination. Some students with disabilities, such as children with Down syndrome, struggle to master motor skills, frequently displaying poor control of their body movements due to decreased strength and slow reaction times. Although students with Down syndrome may eventually reach motor milestones, it generally takes them much longer than it does their nondisabled peers and often proves to be a frustrating process. (Munsell and Bryant Davis 3)

Munsell and Bryant Davis write about how Laban's movement framework helps children with Down Syndrome engage in physical activities to reach developmental milestones in a fun and effective way.

> To help children with Down syndrome reach these milestones in a fun way, Jobling,Virji-Babul, and Nichols (2006) devised a movement program specifically addressing the physical needs of these students. The training program, on the basis of Laban's movement framework (1963), is constructed around exploring the core concepts of space, weight, time, and flow. The researchers discovered that "for children with intellectual disabilities such as Down syndrome, Laban's core concepts...could be used with a movement education approach to provide an ideal framework within which children can learn to move. (pp. 35–36)

Participation for students with disparities in a dance class exposes them regularly to practice with the Laban's movement framework concepts of space, weight, time, and flow. Regular participation in dance also exposes students with disabilities to an opportunity to build strength and motor skills through practicing body, space, and effort awareness, developing movement language, and developing confidence in allowing students time for body movement exploration. They also discuss how movement enriches

other important areas of their lives including social skills, communication skills, and personal boundaries.

> Jobling, Virji-Babul, and Nichols (2006) created the program with four main goals in mind: (a) developing body, space, and effort awareness, (b) developing a movement language, (c) developing confidence in movement by allowing students sufficient time for movement exploration, and (d) developing opportunities for students to interact and communicate with each other. According to the teachers, students who participated in the program displayed improved communication skills, improved body awareness, and improved respect for personal boundaries. Although this program was designed specifically for students with Down syndrome, the structure of the program appears to be adaptable and usable in a varying exceptionalities classroom. (Munsell and Bryant Davis 3)

Researcher Observation
Rating Scale Data

The researcher compared student observational rating scale scores from week one to the scores that were recorded week nine, the final week of the study. The scores were compared to see if student scores improved over the course of the study. A student participant could achieve a maximum score of eighty points, which would result if the student received a rating of five across all skills areas observed. The students were rated on their ability to perform sixteen different gross motor skill and strength tasks that were observed over the course of the class with rating scores ranging from a one to a five. The scores were interpreted two different ways. First, the student's scores were totaled out of eighty points from week one and nine. The second method divided the total score by sixteen to find each student's average score from week one and nine. Student #1 was absent, but the other thirteen student participants' total scores and average scores improved over the course of the study.

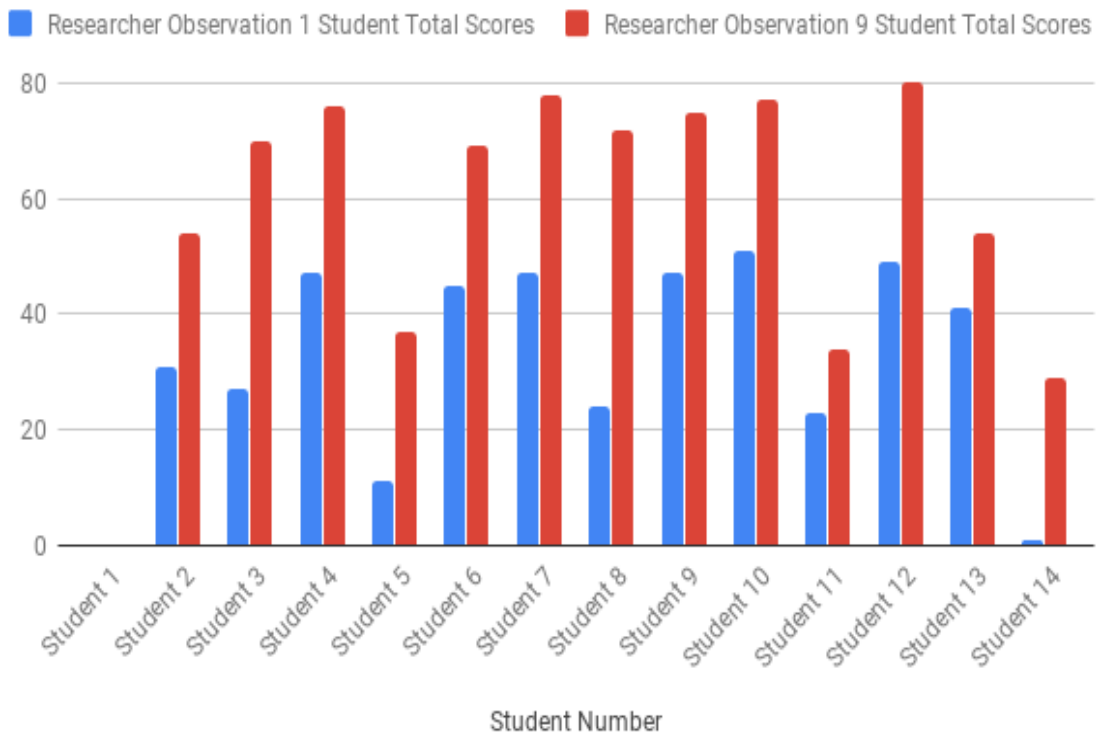

Figure 2. Researcher's Ratings of Student Participant's Total Gross Motor Skills & Strength Scores from Week 1 Compared to Week Nine

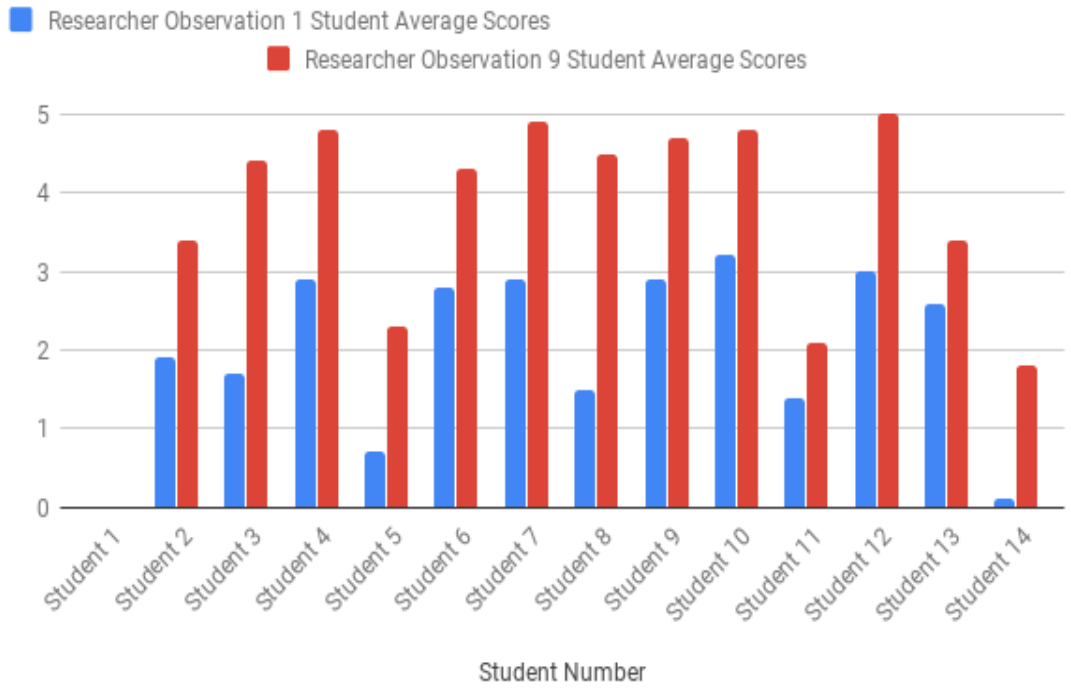

Figure 3. Researcher's Ratings of Student Participant's Average Gross Motor Skills & Strength Scores from Week 1 Compared to Week Nine

Occupational Therapist
Observation Rating
Scale Data

The occupational therapist was given observation rating scales for each child the week before the beginning of the study. The rating scales asked the occupational therapist to assess each student across sixteen different gross motor and strength skills. The Occupational Therapist was asked to observe each student week one and give each student a rating ranging from one, equaling very poor, to a five, representing very strong for each different observed skill during class. The occupational therapist was asked to do this again week nine, the final week of the study. The week one and week nine scores were compared to see if student growth over the course of the study could be observed.

The following graph shows the students total week one scores from the occupational therapist versus the students' week nine scores. Eight of the fourteen students' scores improved over the course of the study. Five of the fourteen students were either absent week nine or were absent both weeks one and nine.

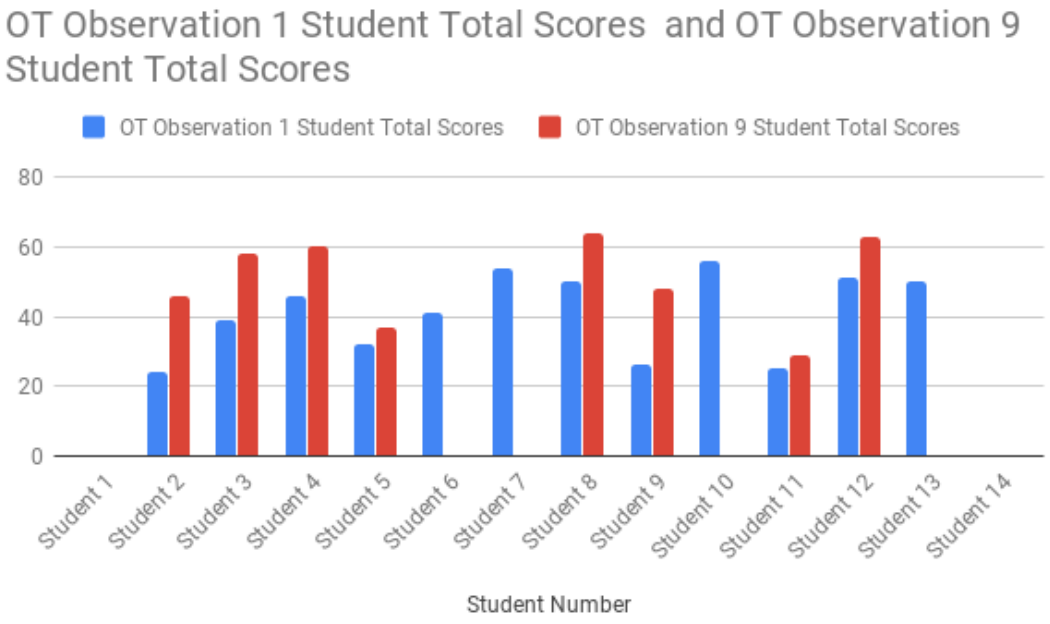

Figure 4. Occupational Therapist's Ratings of Student Participant's Total Gross Motor Skills & Strength Scores from Week 1 Compared to Week Nine

The following graph shows the occupational therapist's week one and week nine student average scores. Each student's rating for each of their sixteen different skills was added together and then divided by sixteen to find each student's average score. The data revealed eight of the fourteen student participants' average scores improved over the course of the study.

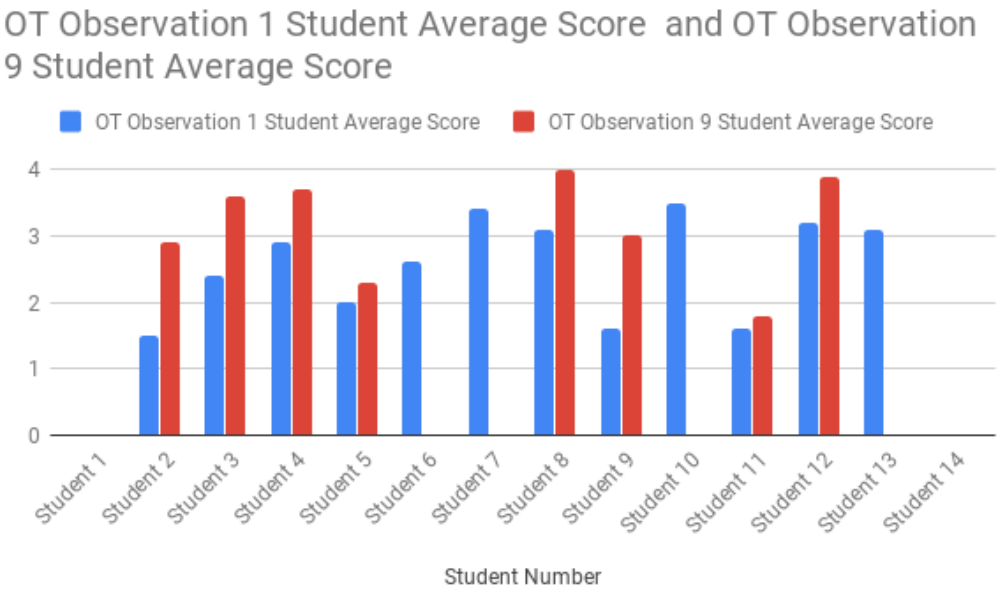

Figure 5. Occupational Therapist's Ratings of Student Participant's Average Gross Motor Skills & Strength Scores from Week 1 Compared to Week Nine

Class Dance Teacher Observation
Rating Scale Data

The adaptive ballet class teacher was given the same observation rating scales that the occupational therapist and the researcher used for each child the week before the beginning of the study. The rating scales asked the Adaptive Ballet Class Teacher to assess each student across the same sixteen gross motor and strength skill areas as the researcher and the occupational therapist. The class instructor gave each student a rating ranging from one, equaling very poor, to a five representing very strong for each different skill observed during class. The class instructor did this on week one and week nine of the study. Student scores were compared to look for growth over the course of the study.

The following graph shows the ballet class teacher's student total score ratings from week one compared to week nine. Thirteen of the fourteen student participants' total

scores improved over the course of the study. One student didn't show up to class week one or week nine.

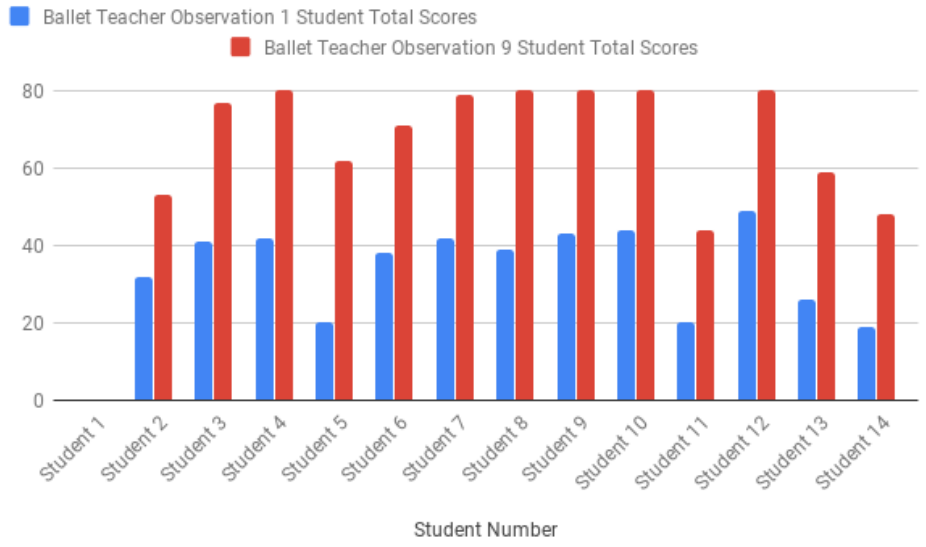

Figure 6. Ballet Class Teacher's Ratings of Student Participant's Total Gross Motor Skills & Strength Scores from Week 1 Compared to Week Nine

The final graph below shows the ballet class teacher's average student scores from week one compared to week nine. Each student participants' scores from week one were added together and then divided by sixteen to find each student's average score. The same process was completed to find week nine student average scores. Thirteen out of fourteen student participants' average scores improved over the course of the study. One student didn't show up to class week one or week nine.

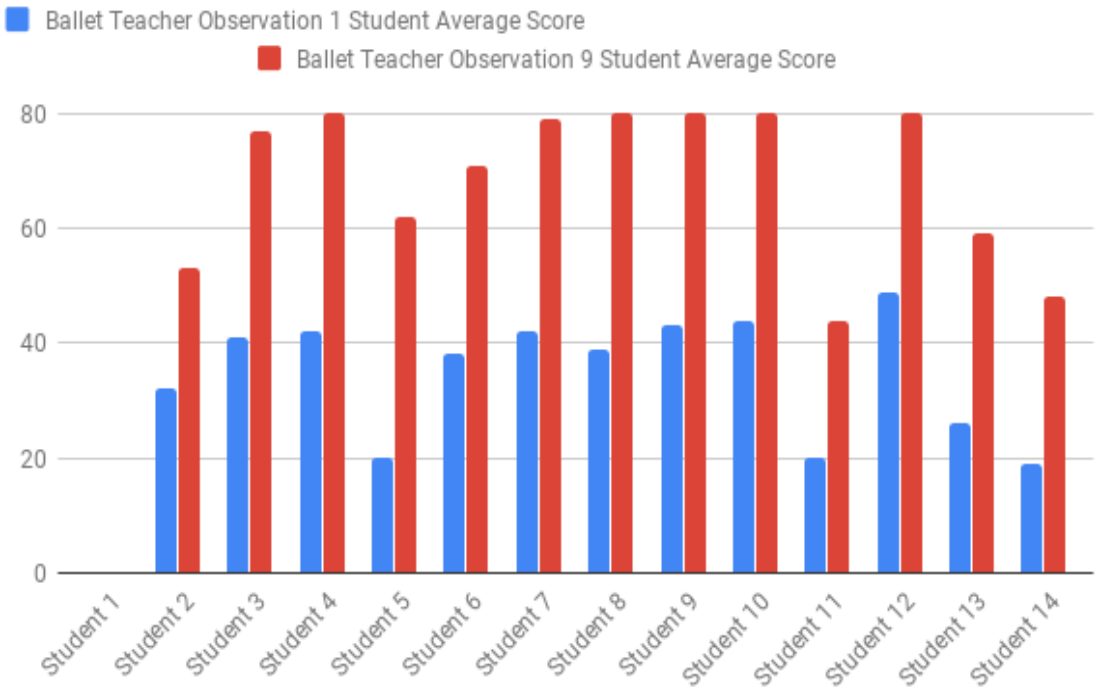

Figure 7. Ballet Class Teacher's Ratings of Student Participant's Average Gross Motor Skills & Strength Scores from Week 1 Compared to Week Nine

Researcher Feedback

After collecting all of the observation rating scales from the occupational therapist and the ballet class teacher, the researcher created a side-by-side comparison chart for each student participant. The following chart lists each student by number and shows each of their week one scores next to their week nine scores. Total scores are listed first and average scores are listed second for each student participant. The occupational therapist's scores are listed first for each student participant, then the ballet teacher's, and finally the researcher's. The following chart of information can be found below in table 1.

Table 2 below shows the whole class of student participants' scores totaled together from week one and week nine as well as whole class average scores from week one and week nine. Again, the occupational therapist's scores are listed first, then the ballet teacher's, and finally the researcher's.

Table 1. Student Observation Individual Total Scores & Average Scores

Individual Student Totals Student #	OT Observation 1	OT Observation 9	Ballet Instructor Observation 1	Ballet Instructor Observation 9	Researcher Observation 1	Researcher Observation 9
#1	Absent	Absent	Absent	Absent	Absent	Absent
#2	Total Points: 24 Average: 1.5	Total Points:46 Average: 2.9	Total Points: 32 Average: 2	Total Points: 53 Average: 3.3	Total Points: 31 Average: 1.9	Total Points: 54 Average: 3.4
#3	Total Points: 39 Average: 2.4	Total Points: 58 Average: 3.6	Total Points: 41 Average: 2.6	Total Points:77 Average:4.8	Total Points: 27 Average: 1.7	Total Points: 70 Average: 4.4
#4	Total Points: 46 Average: 2.9	Total Points: 60 Average: 3.7	Total Points: 42 Average: 2.6	Total Points: 80 Average:5	Total Points: 47 Average: 2.9	Total Points: 76 Average: 4.8
#5	Total Points: 32 Average: 2	Total Points:37 Average: 2.3	Total Points:20 Average: 1.3	Total Points:62 Average: 3.9	Total Points: 11 Average:0.7	Total Points:37 Average: 2.3
#6	Total Points: 41 Average: 2.6	ABSENT	Total Points: 38 Average:2.4	Total Points: 71 Average: 4.4	Total Points:45 Average: 2.8	Total Points:69 Average: 4.3
#7	Total Points: 54 Average: 3.4	ABSENT	Total Points: 42 Average: 2.6	Total Points: 79 Average: 4.9	Total Points: 47 Average: 2.9	Total Points: 78 Average: 4.9
#8	Total Points: 50 Average: 3.1	Total Points: 64 Average: 4	Total Points: 39 Average: 2.4	Total Points: 80 Average: 5	Total Points: 24 Average: 1.5	Total Points:72 Average: 4.5

Table 1. Student Observation Individual Total Scores & Average Scores, continued outside the table on page 44

#9	Total Points:26 Average: 1.6	Total Points: 48 Average: 3	Total Points:43 Average: 2.7	Total Points: 80 Average: 5	Total Points: 47 Average: 2.9	Total Points: 75 Average: 4.7
#10	Total Points: 56 Average: 3.5	ABSENT	Total Points: 44 Average: 2.8	Total Points: 80 Average: 5	Total Points:51 Average: 3.2	Total Points: 77 Average: 4.8
#11	Total Points: 25 Average: 1.6	Total Points: 29 Average: 1.8	Total Points: 20 Average: 1.3	Total Points:44 Average:2.8	Total Points: 23 Average: 1.4	Total Points:34 Average: 2.1
#12	Total Points:51 Average: 3.2	Total Points: 63 Average: 3.9	Total Points: 49 Average: 3	Total Points:80 Average: 5	Total Points: 49 Average: 3	Total Points: 80 Average: 5
#13	Total Points: 50 Average: 3.1	Absent	Total Points:26 Average: 1.6	Total Points:59 Average: 3.7	Total Points: 41 Average: 2.6	Total Points:54 Average: 3.4
#14	JOINED STUDY LATE	ABSENT WEEK 9	Total Points: 19 Average: 1.2	Total Points 48 Average: 3	Total Points:1 Average: .1	Total Points: 29 Average: 1.8

Table 2. Whole Class Total Observation Scores & Average Scores

Whole Class Totals	OT Week 1 Scores	OT week 9 Scores	Ballet teacher week 1 scores	Ballet Teacher week 9 scores	Researcher week 1 scores	Researcher week 9 scores
Total Points	494 points	810 points	423 points	893 points	443 points	805 points
Average Points	41 points 12 of the 14 students present week 1	101 points 8 of the 14 students present week 9	32 points 13 of the 14 students present week 1	69 points 13 of the 14 students present week 9	34 points 13 of the 14 students present week 1	62 points 13 of the 14 students present week 9

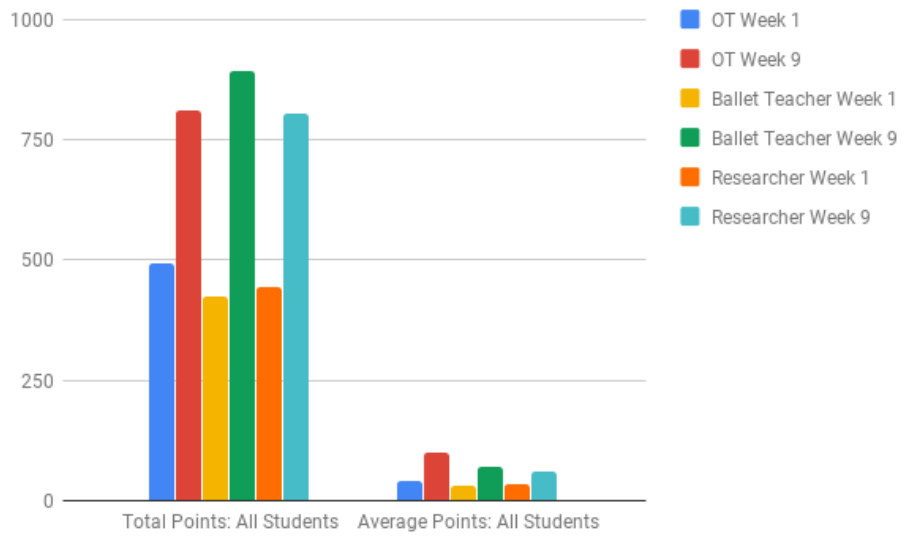

Figure 8. Whole Class Student Participant Total & Average Scores

Finally, figure 8 puts information from both of the table 1 and table 2 into one graph. The researcher found that her week one scores were comparable with both the occupational therapist's and the ballet teacher's. The researcher also found her week nine scores to be comparable with the occupational therapist's and the ballet teacher's. The student participants overall growth over the course of the study was within the same ranges among all three adults who observed the classes and completed the observation rating scales.

CHAPTER V

CONCLUSION

As discussed in the previous chapters, this research studied the effects of dance on students with Down Syndrome's gross motor skills and overall strength over the course of nine weeks. Did regular participation in a weekly dance class have an effect on students' gross motor and strength skills? The final chapter of this thesis gathers the results and draws conclusions based on the feedback from the study's participants, their parents, the researcher, the occupational therapist, and the adaptive dance class instructor.

The study consisted of a group of fourteen student participants who were observed by the researcher, the occupational therapist, and the dance class instructor on a weekly basis. The student participants took a dance class for one hour a week with the ballet class instructor while the occupational therapist assessed the students with their skills. The researcher strictly observed. During the class, the students participated in a "center floor full body warm up", "across the floor", "center floor creative movement games and activities", and finally a "cool down stretch" portion of class. The students over the weeks worked their way up to participating in a few ballet barre exercises including pliés, relevés, and sautés from first position. The students learned ballet and dance terminology with each newly introduced step as well as new movement phrases. The students also participated in ballet pantomime during their center floor creative movement exercises and activities.

This study helped to answer the essential questions originally posed regarding whether regular participation in a dance class for students impacted by Down Syndrome would help to build gross motor skills and overall strength in student participants. Did receiving regular ballet instruction from the ballet class teacher and working with the occupational therapist during class aid in building these skills? This research also aimed to help advocate for the importance of dance for students with special needs in hopes to spread awareness and see more programs such as this one offered in the future in both private dance studio settings as well as in public school districts. This segment also considers some limitations linked with the research study and provides suggestions for future research in this area of dance for the special needs population.

Interpretation of Findings

The interpretations of this study was compiled from parent pre and post-surveys, the occupational therapist's and the ballet class instructor's observation rating scales that they completed during week one and week nine of the study for each student, as well as the researcher's weekly ratings on each student's observation rating scale. The researcher hoped to answer, "Does weekly participation in a dance class with the help from a ballet teacher and occupational therapist help improve students with Down Syndrome's gross motor skills and overall strength?" The researcher pursued these inquiries through the use of the developed assessment tools with parent, occupational therapist, and the ballet class teacher's input.

The researcher did receive positive input from the parents on both the pre and post-surveys in the open-ended response questions. The parents, overall reported that because of their child's participation in the class, they had not only improved their gross

motor skills which is what this study set out to find, but also their child's lives improved in other areas as well, including confidence, focus, attention to tasks, behavior in school and at home, and coordination. The parents also discussed with the researcher verbally during class observations that this class was the first extracurricular activity their child was ever asked to be a part of which resulted in the students building beautiful friendships outside of school. Many parents discussed verbally with the researcher that this class created a wonderful network for both the parents and the student participants and built connections and friendships. All the parents verbally expressed an interest in having the class continue and grow in the future because it was nothing but a positive experience for their child and their family.

The researcher did find improved student gross motor skills and strength scores from the observation rating scales that were completed by the occupational therapist, the ballet class instructor, and the researcher over the course of the study. It is worth noting, that the three adults who completed the rating scales showed similar scores for each student participant as well as whole class totals over the course of the study when scores were compared at the conclusion of the study period.

In conclusion, this research had a positive outcome in advocating for the importance of dance within the special needs community, as well as the importance of raising awareness of its potential positive effects. This research was conducted in hopes of programs, such as this one, being more readily offered across private studios as well as in public school settings.

Limitations of Study

The researcher found that this study did have a positive impact on its student participants but the researcher also feels it is important to acknowledge the limitations from the research including, student absences, limited responses/missing responses from parents on the pre & post surveys, limited time for conducting the research, and not having access to a control group.

Some students were absent some of the weeks that data was collected leaving their scores incomplete. Some student participant's parents did not turn in their child's post observation form leaving their parents input examining their growth incomplete. Some parents completed both the pre & post surveys but provided limited responses when it came to the open-ended questions. The study took place over the course of nine weeks which was a limited amount of time. Possibly more growth could have been measured if the study allowed for more time. Lastly, the study might have gathered more information if the researcher had access to a control group. This might have helped, as well as to eliminate any bias.

Recommendations for Future Research

Studies such as this one could be further developed by future researchers by including a more diverse special needs student population. This study included only students with Down Syndrome. It would be interesting to conduct research on how dance impacts children with various disabilities. Future studies could also include mid study score collection from study participants including the class teacher, and any additional adult professionals working with the students, and the parents. This could help monitor

progress throughout the study instead of only collecting data in the beginning and again at the end.

Conclusion

Overall, students who are impacted with Down Syndrome do show improvement with their gross motor skills as well as overall body strength from participation in a weekly dance class. Students with Down Syndrome who are regularly exposed to dance, once a week display stronger gross motor abilities as a result. When students with disabilities are allowed access to dance, they build stronger bodies. With stronger bodies, these students can enjoy better body functioning, which can be applied across all areas of their everyday lives.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

UNIVERSITY OF
NORTHERN COLORADO

Institutional Review Board

DATE: March 6, 2019

TO: Jennifer Canfield, MA
FROM: University of Northern Colorado (UNCO) IRB

PROJECT TITLE: [1333173-3] The Effects of Dance on Gross Motor Skills and Strength in Students with Down Syndrome
SUBMISSION TYPE: Amendment/Modification

ACTION: MODIFICATION
APPROVED APPROVAL DATE: March 6, 2019
EXPIRATION DATE: November 16, 2019
REVIEW TYPE: Expedited Review

Thank you for your submission of Amendment/Modification materials for this project. The University of Northern Colorado (UNCO) IRB has APPROVED your submission. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on applicable federal regulations.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration

date of November 16, 2019.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Nicole Morse at 970-351-1910 or nicole.morse@unco.edu. Please include your project title and reference number in all correspondence with this committee

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Northern Colorado (UNCO) IRB's records.

APPENDIX B

LETTERS OF SUPPORT

PENNSYLVANIA BALLET
COMMUNITY ENGAGEMENT

To whom it may concern,

Pennsylvania Ballet (PBA) supports Jennifer Canfield's observation of its Adaptive Dance Class at Artist in Motion Dance Studio in Cherry Hill, New Jersey. PBA is an advocate for the importance of dance for everyone; we believe that encouraging academic research is one of the most effective ways to demonstrate the effects of creative movement on the mind and body.

The Adaptive Dance Class meets on Saturdays from 12:30-1:30 pm. Ms. Canfield is welcome to observe and conduct pre and post surveys during class as she studies the effects of dance on gross motor and strength development in students with Down Syndrome.

Best,

Sarah Cooper

Director of Community Engagement

Pennsylvania Ballet

Artists In Motion Dance Studio

1724 Marlton Pike East, Cherry Hill, NJ 08003

Office: 856.427.0100

www.aimdanceandfitness.com

AIMCherryHill@aol.com

artists
in motion
DANCE STUDIO

October 9, 2018

To Whom It May Concern,

This letter will serve as authorization of Jennifer Canfield to conduct research entitled. The Effects of Dance on Gross Motor Skills and Strength in Students with Down Syndrome. All surveys, observations and presentations are approved and will be supervised by staff. If you have any questions or concerns please feel free to contact me.

Sincerely,

Michele Wolf Owner/Artistic Director

Artists In Motion Dance Studio

APPENDIX C

INSITUTIONAL REVIEW BOARD CONSENT FORMS

UNIVERSITY of NORTHERN COLORADO

PARENT CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH
UNIVERSITY OF NORTHERN COLORADO

Project Title: The Effects of Dance on Gross Motor Skills and Strength in Students with Down Syndrome
Researcher: Jennifer Canfield, School of Theatre Arts and Dance
Phone Number: (856) 906-5139 E-mail: canf2195@bears.unco.edu

The intent of this research is to observe student participation and discover the impact dance has on gross motor and strength development in students with Down Syndrome. This project will attempt to answer the following questions: (1) Does participation in a weekly dance class have an effect on the gross motor skill development of students with Down Syndrome? (2) Does participating in a weekly dance class, receiving ballet instruction, and working with a physical therapist in class increase overall muscle strength in the participants? As part of a graduate research project, this research may provide data which proves that participation in dance for students with Down Syndrome leads to strengthened gross motor skills and functioning. The results of the study could be added to the already growing archive of research in favor of dance for students with special needs as well as help to provide support and funding for adaptive dance programming. If you grant permission and if your child indicates a willingness to participate I will be observing them a total of nine times during their ballet class and noting their progress in the areas of gross motor skills and strength using an observation rating scale. Your child will not be asked to do anything extra or anything differently during this time. If granted permission, I will be simply watching your child dance and noting progress over time.

I foresee no risks to subjects beyond those that are normally encountered during participation in a ballet class. Your child's participation will not be solicited during the class observations. Your child will likely enjoy being a part of the study and the positive attention received.

The completed consent forms will be taken by the researcher to Crabbe Hall, room 308, the office of Christy O'Connell-Black, Dance Education MA co-coordinator. This is where the consent forms will also be stored. All consent forms will be destroyed after three years. Your child's identity will be protected through the use of pseudo names in all thesis writing.

Please feel free to call or email me if you have any questions or concerns about this research and please retain one copy of this letter for your records.

Thank you for assisting me with my research.

Sincerely,

Jennifer Canfield

Participation is voluntary. You may decide not to have your child participate in this study and if your child begins participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please sign below if you would like your child to participate in this research. A copy of this form will be given to you to retain for future reference. If you have any concerns about your selection or treatment as a research participant, please contact Nicole Morse, Office of Research, Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-1910.

_____ _____

Child's Full Name (please print) Child's Birth Date (month/day/year)

_____ _____

Parent/Guardian's Signature Date

_____ _____

Researcher's Signature Date

STUDENTASSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH
UNIVERSITY OF NORTHERN COLORADO

Hi!

My name is Jennifer Canfield, and I am a student at the University of Northern Colorado. I am studying dance education. That means I am studying how to be the best dance teacher I can be. I am also studying how dance helps kids to have stronger skills and bodies. I am working on a project where I need to watch students just like you, dance! I would like to come watch your ballet class as part of my studies. If you want, you can be a part of my research by allowing me to watch you dance.

Allowing me to watch you in your dance class nine times won't hurt you. You will likely enjoy being a part of the study. Your parents have said it's okay for you to be a part of my project, but you don't have to if you don't want to. It's up to you! Also, if you say "yes" but then change your mind, you can stop any time you want to. Do you have any questions for me about my research?

If you want to be in my research project, sign your name below and write today's date next to it. Thanks!

Student Date

Researcher Date

UNIVERSITY of NORTHERN COLORADO

DANCE TEACHER & PHYSICAL THERIPIST CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH

UNIVERSITY OF NORTHERN COLORADO

Project Title: The Effects of Dance on Gross Motor Skills and Strength in Students with Down Syndrome

Researcher: Jennifer Canfield, School of Theatre Arts and Dance
Phone Number: (856) 906-5139 E-mail: canf2195@bears.unco.edu

Advisor: Christy O'Connell-Black
Phone Number: (970) 351-4133 Email: Christy.OConnellBlack@unco.edu

Purpose and Description: The intent of this research is to observe student participation and discover the impact dance has on gross motor and strength development in students with Down Syndrome. This project will attempt to answer the following questions: (1) Does participation in a weekly dance class have an effect on the gross motor skill development of students with Down Syndrome? (2) Does participating in a weekly dance class, receiving ballet instruction, and working with a physical therapist in class increase overall muscle strength in the participants? As part of a graduate research project, this research may provide data which proves that participation in dance for students with Down Syndrome leads to strengthened gross motor skills and functioning. The results of the study could be added to the already growing archive of research in favor of dance for students with special needs as well as help to provide support and funding for adaptive dance programming. If you grant permission I will be observing nine times during the ballet class and noting student progress in the areas of gross motor skills and strength using an observation rating scale. The students will not be asked to do anything extra or anything differently during this time. If granted permission, I will be simply watching the children dance during class and noting progress over time.

During observation weeks one and observation nine, you will be asked to fill out an observation rating scale noting each of the student participant's ability to perform specific gross motor and strength steps and movements. It will take approximately five minutes per participant to complete the observation rating scales. Your responses will be used as part of my research advocating for dance inclusion for students with special needs, grow adaptive dance programing in our area, as well as document the progress made over time with student gross motor skills and overall strength from participation in a weekly dance class.

I foresee no risks to subjects beyond those that are normally encountered during participation in a ballet class. Student participation will not be solicited during the class observations.

The completed consent forms will be taken by the researcher to Crabbe Hall, room 308, the office of Christy O'Connell-Black, Dance Education MA co-coordinator. This is where the consent forms will also be stored. All consent forms will be destroyed after three years. Your identity as well as the students' will be protected through the use of pseudo names in thesis writing.

Please feel free to call or email me if you have any questions or concerns about this research and please retain one copy of this letter for your records.

Thank you for assisting me with my research.

Participation is voluntary. You may decide not to allow your child to participate in this study
and if (s)he begins participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please sign below if you would like to participate in this research. A copy of this form will be given to you to retain for future reference. If you have any concerns about your selection or treatment as a research participant, please contact Nicole Morse, IRB Administrator, Office of Research, Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-1910.

_____

Subject's Signature Date

_____

Researcher's Signature Date

APPENDIX D

RESEARCH INSTRUMENTS

UNIVERSITY of NORTHERN COLORADO

Parent Pre-Survey:

Participants Name_____

Skill:	Yes, consistently	Yes, but only some of the time	No, not mastered yet
My child can run freely without frequent stumbling or falling			
My child can balance on one foot for a brief period of time			
My child can hop on both feet several times without assistance			
My child can walk in a straight line forwards and backwards			
My child can skip alternating feet			
My child can hops on one foot without assistance			
My child can climb up and down stairs with alternating feet (one foot per stair)			
My child can climb up and down from furniture without assistance (Ex: able to get out of own bed, able to climb off and on a sofa).			
My child can walk on their tip toes like a dancer			
My child is able to ride a bike			
My child can kick a ball (unilateral movement)			
My child can catch a ball			
My child can jump over an object			
My child can imitate simple bilateral movements (Ex: the child can copy you if you raise both arms over your head)			
My child can imitate simple bilateral movements using different quadrants of the body at the same time (Ex: the child can copy you raising one arm and opposite leg at the same time)			

Please check one box for each of the skills.

Please describe your child's gross motor skill functioning and overall strength to the best of your ability:

Has your child ever received physical therapy for motor skill functioning/physical functioning?

Please explain how you think your child will benefit physically (gross motor and overall strength wise) from participating in weekly ballet class?

Thank you for your partnership!

Jennifer Canfield
Certified New Jersey Elementary/Special Education Teacher
BA Holy Family University Integrated Preschool Teacher
Moorestown Public School District
Dance Education Graduate Student
University of Northern Colorado
canf2195@bears.unco.edu
(856) 906-5139

UNIVERSITY of NORTHERN COLORADO

Parent Post-Survey:

Participants Name_____

Please check one box for each of the skills.

Skill:	Yes, consistently	Yes, but only some of the time	No, not mastered yet
My child can run freely without frequent stumbling or falling			
My child can balance on one foot for a brief period of time			
My child can hop on both feet several times without assistance			
My child can walk in a straight line forwards and backwards			
My child can skip alternating feet			
My child can hops on one foot without assistance			
My child can climb up and down stairs with alternating feet (one foot per stair)			
My child can climb up and down from furniture without assistance (Ex: able to get out of own bed, able to climb off and on a sofa).			
My child can walk on their tip toes like a dancer			
My child is able to ride a bike			
My child can kick a ball (unilateral movement)			
My child can catch a ball			
My child can jump over an object			
My child can imitate simple bilateral movements (Ex: the child can copy you if you raise both arms over your head)			

My child can imitate simple bilateral movements using different quadrants of the body at the same time (Ex: the child can copy you raising one arm and opposite leg at the same time)			

Do you feel that your child's gross motor skills and overall strength have improved from participation in a weekly ballet class? Please include your thoughts about your child's overall coordination, strength, balance, etc.) Please be specific.

_____
_____
_____
_____
_____
_____

Has participation in dance positively impacted your child in any other areas of their lives? (Examples include: school performance, attention, overall confidence, motivation, behavior, other therapies/activities they participate in?) Please be specific.

_____
_____
_____
_____
_____
_____

Thank you for your partnership!

Jennifer Canfield
Certified New Jersey Elementary/Special Education Teacher, BA Holy Family University
Integrated Preschool Teacher, Moorestown Public School District
Dance Education Graduate Student, University of Northern Colorado
canf2195@bears.unco.edu
(856) 906-5139

UNIVERSITY of NORTHERN COLORADO

Observation Rating Scale:
Gross Motor Skills & Strength:
Rating scale of the following skills 1-5
1-very poor 5- very strong

Participant's Name: Student

Gross Motor Skill & Comments: **Balance**	Observation One	Observation Two	Observation Three	Observation Four	Observation Five	Observation Six	Observation Seven	Observation Eight	Observation Nine
Stands on one leg									
Stands with feet next to each other in first position									
Shifts weight from one foot to the other									
Stands in									

relevé									

Gross Motor Skill & Comments: **Coordination**	Observation One	Observation Two	Observation Three	Observation Four	Observation Five	Observation Six	Observation Seven	Observation Eight	Observation Nine
Plié									
Jumping using plié to initiate movement and to land									
Standing with lower body and upper body in different placement positions									
Sequences multiple dance steps together									

Gross Motor Skill & Comments: **Body Awareness, knowing where one's body is in space**	Observation One	Observation Two	Observation Three	Observation Four	Observation Five	Observation Six	Observation Seven	Observation Eight	Observation Nine
Matching body positioning to the teacher									
Awareness of limb positioning in space									
Proper body positioning									
Awareness of directionality in space									

Gross Motor Skill & Comments: **Strength**	Observation One	Observation Two	Observation Three	Observation Four	Observation Five	Observation Six	Observation Seven	Observation Eight	Observation Nine
Maintains consistent stamina throughout class									
Participation throughout class without needing additional break time									
Completes steps, phrases, and combinations									
Dances for 1 minute without stopping									